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PATENT APPLICATION

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IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Andrew David Birrell

Confirmation No.: 2074

Application No.: 09/668,643

Examiner: Alina A. Boutah

Filing Date: September 22, 2000

Group Art Unit: 2143

Title: METHOD AND SYSTEM FOR COOPERATIVELY BACKING UP DATA ON COMPUTERS IN A NETWORK

Mail Stop Appeal Brief-Patents
Commissioner For Patents
PO Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF

Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on Aug. 23, 2007.

☒ The fee for filing this Appeal Brief is \$510.00 (37 CFR 41.20).

☒ No Additional Fee Required.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

☐ (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d)) for the total number of months checked below:

☐ 1st Month
\$120

☐ 2nd Month
\$460

☐ 3rd Month
\$1050

☐ 4th Month
\$1640

☐ The extension fee has already been filed in this application.

☒ (b) Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

Please charge to Deposit Account 08-2025 the sum of \$ 510. At any time during the pendency of this application, please charge any fees required or credit any over payment to Deposit Account 08-2025 pursuant to 37 CFR 1.25. Additionally please charge any fees to Deposit Account 08-2025 under 37 CFR 1.16 through 1.21 inclusive, and any other sections in Title 37 of the Code of Federal Regulations that may regulate fees.

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Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Andrew D. Birrell, et al.)

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Serial No. 09/668,643)

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Entitled: METHOD AND)
SYSTEM FOR COOPERATIVELY)
BACKING UP DATA ON)
COMPUTERS IN A NETWORK)

APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir/Madame:

This is Applicants' brief on appeal from the final office action mailed on April
19, 2007.

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(i) Real Party in Interest

The real party in interest is Hewlett-Packard Development Company, L.P., the assignee of record, which is a wholly-owned affiliate of Hewlett-Packard Company.

(ii) Related Appeals and Interferences

The Applicants are not aware of any appeals or interferences related to the above-identified patent application.

(iii) Status of Claims

Claims 1-58 are pending in this application. Claims 1-4, 15-28, 30 and 44-58 have been finally rejected and are the subject of this appeal. Claims 5-14, 29 and 31-43 are withdrawn.

(iv) Status of Amendments

All amendments have been entered.

(v) Summary of Claimed Subject Matter

Background

Computer file systems are safeguarded in an effort to prevent irrevocable loss of data stored in the file system. For safeguarding the data, backup copies of the data are created. Traditionally, backup involves creating a copy of the data and storing the backup copy safely. More particularly, traditional backup creates one or a few backup copies, stores them on a storage medium, and deposits the storage media at a safe, preferably distant, place. To recover lost data, the storage medium is located and the data is retrieved therefrom. This approach requires manual handling of the backup

copies or a more sophisticated automated handling. Manual handling is slow and vulnerable to errors and it requires human diligence and discipline. Automated handling can overcome some of the manual handling shortcomings but it can be expensive and difficult to implement. In either case, considerable administrative and capital expense is needed for setting up a backup system. Backup administration involves, for example, scheduling and monitoring backup operations, mounting and dismounting backup media, and maintaining backup media on and off site. Capital expenses are incurred in purchasing of backup media such as tape drives and disk arrays and in acquisition of storage space for the backup media. Advances in technology have made it possible to store and retrieve more data and to access it more quickly. Applicants' specification at page 1, line 15, to page 2, line 5.

What is needed is improved administration of storage of backups in the absence of central control. The present invention addresses this and related issues. See Applicants' specification at page 4, lines 4-6.

Claim 1

Applicants' claim 1 is an independent claim which is directed toward "[a] method for backing up data on a plurality of computers connected via a network." Figure 1 of the Applicants' specification illustrates an example of a cooperative backup system in which the method may be implemented. And, as explained in the Applicants' specification at page 7, lines 21, the invention operates in the context of a collection of computers connected by a network.

Steps of the method of claim 1 include "forming one or more backup partnerships among the plurality of computers such that each computer in a backup partnership commits under an agreement to store backup data received from one or

more backup partners, whereby a first computer in each partnership assumes the task of storing backup data received from one or more other computers in the partnership and one or more of the other computers in the partnership assume the task of storing backup data received from the first computer." As explained in the Applicants' specification at page 9, lines 9-15, a first computer system assumes the task of holding backup data received via the network from a second computer system; in return, a second computer system assumes the task of holding backup data from the first computer system. Hence, the term "backup partners." And, as explained at page 9, lines 15-16, the first and second backup partners mutually impose on each other the duty to maintain the backup data by adhering to a cooperative backup protocol. As further explained at page 9, lines 21-22, the first computer system may back up more than one computer system and, in return, more than one computer system helps back up the first computer system. The selection of potential backup partners and the formation of the partnerships is described in the Applicants' specification at page 16, line 16, to page 19, line 30.

Claim 1 also recites "backing up data in accordance with each agreement." As explained in the Applicants' specification at page 10, lines 16-18 and at page 11, lines 3-7, the data to be backed up is identified and distributed to backup partners.

Claim 1 further recites a step of "periodically verifying that previously backed up data is being retained by the computers committed to act as backup partners in accordance with each agreement." As explained in the Applicants' specification at page 11, lines 19-21, participation in the cooperative backup system involves establishing backup partnerships among computer systems and honoring the reciprocal backup agreements. And, as explained at page 11, lines 21-26, to verify that the agreements with its backup partners are honored, the computer system

verifies periodically that its backup partners have retained previously backup data. A manner of performing this verification is described in detail in the Applicants' specification at page 12, line 14, to page 15, line 5.

Claim 2

Claim 2 is dependent from claim 1 and recites "selecting potential backup partners from among the plurality computers based on predetermined criteria." The Applicants' specification explains at page 18, line 21, to page 19, line 15, that to establish the reciprocal agreement, the computer system exchanges information with a potential backup partner to determine whether the potential backup partner is able to meet certain requirements, such as a predictable and suitable time schedule for being available, and having sufficient network communication bandwidth for transferring data.

Claim 3

Claim 3 is dependent from claim 1 and recites "negotiating the agreements between the plurality of computers based on predetermined requirements, including backup requirements." The Applicants' specification explains at page 18, line 21, to page 19, line 15, that to establish the reciprocal agreement, the computer system exchanges information with a potential backup partner to determine whether the potential backup partner is able to meet certain requirements related to backing up of data. And, as explained at page 19, lines 16-21, the exchange of this information goes in both directions between the potential backup partners; if they agree that their requirements can be mutually met, the reciprocal agreement between them can be made.

Claim 4

Claim 4 is dependent from claim 1 and recites "wherein the plurality of computers administer a distributed cooperative backing up of data in the absence of central control." The Applicants' specification explains at page 9, lines 26-27, that the administration of the of the cooperative backup among the backup partners can be achieved in the absence of central control. Figure 1 of the Applicants' specification illustrates an example of a cooperative backup system in which the computer systems can be geographically distributed.

Claims 5-14

Claims 5-14 are withdrawn.

Claim 15

Claim 15 is dependent from claim 1 and recites "wherein each of the plurality of computers has a storage, the storage being periodically scanned to find data to be backed up and identify data previously backed up that no longer needs to be backed up, the data to be backed up being retrieved from the storage for a next periodic backup." The Applicants' specification explains at page 10, lines 16-18, that the computer system scans its data storage to find new data to be backed up and to possibly identify previously backup data that no longer needs to backed up. For example, as explained at page 10, line 28, to page 11, line 1, certain sub-trees of a file system that contain files that have been changed may be specified for daily backups. And, as explained at page 11, lines 3-5, following the designation of data to be backed up, the data may be encoded and distributed to backup partners.

Claim 16

Claim 16 is dependent from claim 1 and recites "wherein the verifying that previously backed up data is retained by the backup partners includes monitoring the backup partners." The Applicants' specification explains at page 11, lines 21-26, that to verify that the agreements with its backup partners are honored, the computer system verifies periodically that its backup partners have retained previously backup data.

Claim 16 further recites that "for any one of the backup partners being monitored, selecting a block of data stored at the monitored backup partner, requesting the block of data from the monitored backup partner, and receiving from the monitored backup partner and checking the block of data to determine if the block of data represents a corresponding block of previously backed up data." The Applicants' specification explains at page 12, lines 15-17, that the computer system selects a block of data from among the previously backed up blocks of data purportedly retained by the backup partner. And, at page 13, lines 24-27, the Applicants' specification explains that the selected block is then retrieved and verified. This can be accomplished by comparing hash values (Applicants' specification at page 13, line 26, to page 14, line 12) or through cryptography (Applicants' specification at page 14, lines 13-26).

Claim 17

Claim 17 is dependent from claim 16 and recites "wherein the block is selected randomly." The Applicants' specification explains at page 12, line 22, that

the block selected for verifying that previously backed up data is retained can be selected randomly.

Claim 18

Claim 18 is dependent from claim 16 and recites "wherein the block is selected using a protocol to produce a number that corresponds to the selected block and that is controlled by at least two backup partners." The Applicants' specification explains at page 12, lines 26-29, that the computer system and its backup partner may engage in a protocol to produce a random number, but in which neither of them controls the outcome individually. And, as explained at page 12, lines 29-30, the block that corresponds to the random number is selected as the data block to be verified.

Claim 19

Claim 19 is dependent from claim 18 and recites "wherein the protocol, being performed by any computer of the plurality of computers, includes sending by the computer to a monitored one of its backup partners a hash value of a first random number." The Applicants' specification explains at page 13, lines 11-12, that the computer system may pick random number, Ra , and sends to its backup partner a hash value X , of Ra , where $X=H(Ra)$ and $H()$ is a hash function.

Claim 19 further recites that the protocol includes "receiving by the computer from the monitored one of its backup partners a second random number." The Applicants' specification explains at page 13, lines 12-13, that the backup partner may pick and send to the computer system a second random number Rb .

Claim 19 recites that the protocol also includes "sending by the computer to the monitored one of its backup partners the first random number." The Applicants' specification explains at page 13, lines 13-14, that the computer system then sends R_a to the backup partner which, in turn, verifies that X is indeed the hash value of R_a .

In addition, claim 19 recites that the protocol includes "computing the number from the first and second random numbers by both the computer and the monitored one of its backup partners." The Applicants' specification explains at page 13, lines 15-16, that the computer system and its backup partner then compute a random number R , by combining R_a with R_b .

Claim 20

Claim 20 is dependent from claim 1 and recites "selecting another computer connected via the network to be a new backup partner if it is determined that a backup partner has reneged by not retaining the previously backed up data." The Applicants' specification explains at page 15, lines 6-8, that if the computer system finds that a backup partner has not retained previously backed up data, it considers the backup partner to have reneged on its promise. And, at page 16, lines 11-16, the Applicants' specification explains that a new backup partner may then be selected.

Claim 20 also recites "negotiating and, if an agreement is reached, forming a partnership with the other computer, accepting the other computer as the new backup partner." The Applicants' specification explains at page 18, line 21, to page 19, line 15, that to establish the reciprocal agreement, the computer system exchanges information with a potential backup partner to determine whether the potential backup partner is able to meet certain requirements such as a predictable and suitable time schedule for being available and having sufficient network communication bandwidth

for transferring data. And, as explained at page 19, lines 16-21, the exchange of this information goes in both directions between the potential backup partners; if they agree that their requirements can be mutually met, the reciprocal agreement between them can be made.

Claim 21

Claim 21 is dependent from claim 20 and recites "wherein selecting another computer to be the new backup partner includes determining if there are sufficient backup partners for backing up the data." The Applicants' specification explains at page 16, line 26, to page 17, line 12, that there needs to be a sufficient number of backup partners to provide sufficient storage space and reduce the probability of data loss. And, as explained at page 17, lines 13-15, if there is not a sufficient number of backup partners, the selection process continues to find a prospective backup partner.

Claim 21 also recites that selecting another computer to be the new backup partner also includes "searching for the other computer based on predetermined criteria including one or both of geographic separation and system diversity." The Applicants' specification explains at page 17, line 22 and page 18, line 6, that possible selection criteria include geographic separation and system diversity.

Claim 22

Claim 22 is dependent from claim 20 and recites "wherein if after accepting the other computer as the new backup partner it is determined that the backup partners are insufficient in number for backing up the data, the selecting, negotiating and forming backup partnership with yet another computer are repeated, the determining, selecting, negotiating and forming backup partnership being repeated until the number

of backup partners is sufficient." The Applicants' specification explains at page 19, lines 26-30, that after accepting a new backup partner, the computer system repeats the steps involved in adding a new backup partner until the number of backup partners is sufficient.

Claim 23

Claim 23 is dependent from claim 2 and recites "wherein selecting computers as potential backup partners includes determining if there are sufficient backup partners for backing up the data." The Applicants' specification explains at page 16, line 26, to page 17, line 12, that there needs to be a sufficient number of backup partners to provide sufficient storage space and reduce the probability of data loss. And, as explained at page 17, lines 13-15, if there is not a sufficient number of backup partners, the selection process continues to find a prospective backup partner.

Claim 23 also recites that selecting computers as potential backup partners also includes "searching for computers based on the predetermined criteria that includes one or both of geographic separation and system diversity." The Applicants' specification explains at page 17, line 22 and page 18, line 6, that possible selection criteria include geographic separation and system diversity.

Claim 24

Claim 24 is dependent from claim 3 and recites "wherein negotiating the agreements includes, for any computer of the plurality of computers, exchanging queries between the computer and computers selected as its potential backup partners about each such computer's ability to satisfy the predetermined requirements." The Applicants' specification explains at page 18, line 21, to page 19, line 15, that to

establish the reciprocal agreement, the computer system exchanges information with a potential backup partner to determine whether the potential backup partner is able to meet certain requirements related to backing up of data.

Claim 24 also recites that the predetermine requirements "include one or more of predictable and suitable time schedule for being on-line, suitable network bandwidth, matching backup space requirements, and backup track record." The Applicants' specification explains these requirements at page 18, line 24, to page 19, line 12.

Claim 25

Claim 25 is dependent from claim 24 and recites "wherein, the computer prefers to partner with those of its potential backup partners that satisfy the predetermined requirements." The Applicants' specification explains at page 18, line 27, to page 19, line 4, that the computer system prefers to partner with backup partners that meet requirements such as having a suitable time schedule and sufficient bandwidth.

Claim 26

Claim 26 is dependent from claim 24 and recites "wherein the suitable network bandwidth is equal or larger than a predetermined threshold bandwidth and is characterized by an average bandwidth that is larger than the predetermined threshold bandwidth." The Applicants' specification explains at page 19, lines 1-5, that the computer system prefers to partner with backup partners to which it is connected via a connection having a bandwidth that is at least better than a required threshold

bandwidth and such that the average bandwidth is larger than the threshold bandwidth.

Claim 27

Claim 27 is dependent from claim 24 and recites "wherein the backup track record includes not reneging on a number of other backup partners that is greater than a predetermined number." The Applicants' specification explains at page 19, lines 9-15, that by exchanging messages, the computer systems can keep track of how many times each computer system has reneged on others recently and that the computer system prefers to partner with backup partners that have not done so more than a predetermined number of times.

Claim 28

Claim 28 is dependent from claim 1 and recites "wherein each of the backup partners has a recent copy of a list of its backup partners' other backup partners." The Applicants' specification explains at page 20, lines 1-2, that each backup partner of the computer system stores a recent list of the backup partners for the computer system.

Claim 29

Claim 29 is withdrawn.

Claim 30

Claim 30 is dependent from claim 1 and recites "wherein the agreements are respectively negotiated between the plurality of computers such that in each

partnership each computer commits to avoid making or honoring a data restoration request for a commitment period that is longer than a grace period, wherein the grace period for a backup partner of a computer starts to run if it is determined that the backup partner has failed to respond to such computer verifying that the backup partner is retaining the previously backed up data or to prove to such computer that it is retaining the previously backed up data, and wherein upon the grace period running out such computer considers the backup partner to have reneged on its agreement."

The Applicants' specification explains at page 15, lines 11-14, that a backup partner is considered only temporarily reneged until it is proven that it has reneged over a grace period of time, beyond which the backup partner's transgression is no longer forgiven. As explained at page 15, lines 15-25, the grace period alone may not prevent a computer system from freeloading during the grace period and then, just before the grace period runs out, forming new reciprocal agreements. The Applicants' specification explains at page 15, line 26, to page 16, line 4, that this possibility can be addressed by employing a commitment period that is longer than the grace period, during which restoration requests will not be made or honored. As explained at page 16, lines 7-10, this will force a potential freeloader to start storing data from a subsequent group of backup partners before it stops storing data from its current group of backup partners; as such, the potential freeloader would be required to store more data than it otherwise would if it simply honored its current backup partnership agreements.

Claims 31-43

Claims 31-43 are withdrawn.

Claim 44

Claim 44 is dependent from claim 1 and recites "wherein the data being backed up is file contents." The Applicants' specification explains at page 11, line 27, to page 12, line 1, that files may be divided into file blocks which are then backed up.

Claim 45

Applicants' claim 45 is an independent claim which is directed toward "[a] distributed cooperative backup system." Figure 1 of the Applicants' specification illustrates an example of a distributed cooperative backup system. The system of Figure 1 is described in detail at page 7, line 21, to page 8, line 4.

The system of claim 45 includes "a network." The Applicants' specification explains at page 7, lines 21-23, that the system may include a network by which a collection of computer system are connected.

The system of claim 45 also includes "a loose confederation of computers connected via the network, a plurality of computers from among the loose confederation of computers being configured for distributed cooperative backing up of data, each computer of the plurality of computers having a storage that can be used for providing reciprocal backup services, and each computer of the plurality of computers respectively having a computer readable medium embodying computer program code." Figure 2 of the Applicants' specification illustrates an example of one of the computer systems. The Applicants' specification explains at page 8, line 5-13, that the computer systems are suitably equipped to handle the backup data and backup protocols with data storage, such as hard disks, and a computer readable medium for storing computer program code.

Claim 45 recites that the computer code is configured to cause the computer to "form backup partnerships between the plurality of computers, each of the backup partnerships being of computers such that each computer in a partnership commits under an agreement to store backup data received from one or more backup partners, whereby a first computer in each partnership assumes the task of storing backup data received from one or more other computers in the partnership and one or more of the other computers in the partnership assume the task of storing backup data received from the first computer." As explained in the Applicants' specification at page 9, lines 9-15, a first computer system assumes the task of holding backup data received via the network from a second computer system; in return, a second computer system assumes the task of holding backup data from the first computer system. Hence, the term "backup partners." And, as explained at page 9, lines 15-16, the first and second backup partners mutually impose on each other the duty to maintain the backup data by adhering to a cooperative backup protocol. As further explained at page 9, lines 21-22, the first computer system may back up more than one computer system and, in return, more than one computer system helps back up the first computer system. The selection of potential backup partners and the formation of the partnerships is described in the Applicants' specification at page 16, line 16, to page 19, line 30.

Claim 45 recites that the computer code is configured to cause the computer to "back up data in accordance with each agreement." As explained in the Applicants' specification at page 10, lines 16-18 and at page 11, lines 3-7, the data to be backed up is identified and distributed to backup partners.

Claim 45 recites that the computer code is configured to cause the computer to "periodically verify that previously backed up data is being retained by the computers committed to act as backup partners in accordance with each agreement." As

explained in the Applicants' specification at page 11, lines 19-21, participation in the cooperative backup system involves establishing backup partnerships among computer systems and honoring the reciprocal backup agreements. And, as explained at page 11, lines 21-26, to verify that the agreements with its backup partners are honored, the computer system verifies periodically that its backup partners have retained previously backup data. A manner of performing this verification is described in detail in the Applicants' specification at page 12, line 14, to page 15, line 5.

Claim 46

Claim 46 is dependent from claim 45 and recites "wherein each of the backup partners is allowed to leave the system and return to the system." The Applicants' specification explains at page 9, lines 25-26, that the computer systems can enter and leave the cooperative backup system at any time.

Claim 47

Claim 47 is dependent from claim 45 and recites "wherein prevention of freeloading is enforced by the backup partners, by any of the backup partners being requested to prove that it is retaining the previously backed up data." And, as explained at page 11, lines 21-26, to verify that the agreements with its backup partners are honored, the computer system verifies periodically that its backup partners have retained previously backup data. A manner of performing this verification is described in detail in the Applicants' specification at page 12, line 14, to page 15, line 5.

Claim 48

Applicants' claim 48 is an independent claim which is directed toward "[a] distributed cooperative backup system." Figure 1 of the Applicants' specification illustrates an example of a distributed cooperative backup system. The system of Figure 1 is described in detail at page 7, line 21, to page 8, line 4.

The system of claim 48 includes "a network." The Applicants' specification explains at page 7, lines 21-23, that the system may include a network by which a collection of computer system are connected.

The system of claim 48 includes "a loose confederation of computers connected via the network, a plurality of computers from among the loose confederation of computers being configured for distributed cooperative backing up of data and functioning as backup partners, each computer of the plurality of computers having a storage that can be used for providing reciprocal backup services, and each computer of the plurality of computers respectively having a computer readable medium embodying computer program code." Figure 2 of the Applicants' specification illustrates an example of one of the computer systems. The Applicants' specification explains at page 8, line 5-13, that the computer systems are suitably equipped to handle the backup data and backup protocols with data storage, such as hard disks, and a computer readable medium for storing computer program code.

Claim 48 recites that the computer code is configured to cause the computer to "select computers as potential backup partners from among the plurality of computers based on predetermined criteria." The selection of potential backup partners according to criteria for backing up data is described in the Applicants' specification at page 16, line 16, to page 19, line 30.

Claim 48 also recites that the computer code is configured to cause the computer to "negotiate a reciprocal backup partnership agreement between the computer and the selected computers based on predetermined requirements, including backup requirements." The Applicants' specification explains at page 18, line 21, to page 19, line 15, that to establish the reciprocal agreement, the computer system exchanges information with a potential backup partner to determine whether the potential backup partner is able to meet certain requirements related to backing up of data. And, as explained at page 19, lines 16-21, the exchange of this information goes in both directions between the potential backup partners; if they agree that their requirements can be mutually met, the reciprocal agreement between them can be made.

Claim 48 recites that the computer code is configured to cause the computer to "form partnerships between the computer and selected computers, the computer and the selected computers becoming backup partners by agreeing to cooperatively provide backup services to each other such that a first computer in each partnership assumes the task of storing backup data received from one or more other computers in the partnership and one or more of the other computers in the partnership assume the task of storing backup data received from the first computer and so that a distributed cooperative backing up of data is administered in the absence of central control." As explained in the Applicants' specification at page 9, lines 9-15, a first computer system assumes the task of holding backup data received via the network from a second computer system; in return, a second computer system assumes the task of holding backup data from the first computer system. And, as explained at page 9, lines 15-16, the first and second backup partners mutually impose on each other the duty to maintain the backup data by adhering to a cooperative backup protocol. As

further explained at page 9, lines 21-22, the first computer system may back up more than one computer system and, in return, more than one computer system helps back up the first computer system. And, as explained at page 9, lines 26-27, that the administration of the of the cooperative backup among the backup partners can be achieved in the absence of central control.

Claim 48 also recites that the computer code is configured to cause the computer to "periodically back up data at the backup partners, encoding the data each time before the data is backed up." As explained in the Applicants' specification at page 10, lines 16-18 and at page 11, lines 3-7, the data to be backed up is identified, coded and distributed to backup partners.

Claim 48 recites that the computer code is configured to cause the computer to "periodically verify that previously backed up data is retained by the backup partners." As explained in the Applicants' specification at page 11, lines 19-21, participation in the cooperative backup system involves establishing backup partnerships among computer systems and honoring the reciprocal backup agreements. And, as explained at page 11, lines 21-26, to verify that the agreements with its backup partners are honored, the computer system verifies periodically that its backup partners have retained previously backup data. A manner of performing this verification is described in detail in the Applicants' specification at page 12, line 14, to page 15, line 5.

Claim 49

Applicants' claim 49 is an independent claim which is directed toward "[a] method for backing up data on a plurality of computers connected via a network." Figure 1 of the Applicants' specification illustrates an example of a cooperative

backup system in which the method may be implemented. And, as explained in the Applicants' specification at page 7, lines 21, the invention operates in the context of a collection of computers connected by a network.

Steps of the method of claim 49 include "exchanging messages among computers of the plurality to determine the ability of each to satisfy backup storage requirements of one or more others." The Applicants' specification explains at page 18, line 21, to page 19, line 15, that to establish the reciprocal agreement, the computer system exchanges information with a potential backup partner to determine whether the potential backup partner is able to meet certain requirements such as a predictable and suitable time schedule for being available and having sufficient network communication bandwidth for transferring data.

Claim 49 also recites "forming a partnership among computers of the plurality in which a first computer in the partnership stores backup data received from one or more other computers in the partnership and one or more of the other computers in the partnership store backup data received from the first computer." As explained in the Applicants' specification at page 9, lines 9-15, a first computer system assumes the task of holding backup data received via the network from a second computer system; in return, a second computer system assumes the task of holding backup data from the first computer system. And, as explained at page 9, lines 15-16, the first and second backup partners mutually impose on each other the duty to maintain the backup data by adhering to a cooperative backup protocol. As further explained at page 9, lines 21-22, the first computer system may back up more than one computer system and, in return, more than one computer system helps back up the first computer system.

In addition, claim 49 recites "each of the computers in the partnership periodically verifying that its backup data is being retained by one or more of the

other computers in the partnership." As explained in the Applicants' specification at page 11, lines 19-21, participation in the cooperative backup system involves establishing backup partnerships among computer systems and honoring the reciprocal backup agreements. And, as explained at page 11, lines 21-26, to verify that the agreements with its backup partners are honored, the computer system verifies periodically that its backup partners have retained previously backup data. A manner of performing this verification is described in detail in the Applicants' specification at page 12, line 14, to page 15, line 5.

Claim 50

Claim 50 is dependent from claim 49 and recites "wherein the verifying includes selecting a block of the previously backed up data wherein the selecting is controlled by at least two of the computers." The Applicants' specification explains at page 12, lines 26-29, that the computer system and its backup partner may engage in a protocol to produce a random number, but in which neither of them controls the outcome individually. And, as explained at page 12, lines 29-30, the block that corresponds to the random number is selected as the data block to be verified.

Claim 51

Claim 51 is dependent from claim 1 and recites "wherein the partnership consists of two computers." The Applicants' specification gives an example of a two-computer partnership at page 9, lines 9-20.

Claim 52

Applicants' claim 52 is an independent claim which is directed toward "[c]omputer readable media having stored thereon computer code for a method of backing up data on a plurality of computers connected via a network." The Applicants' specification explains at page 8, line 5-13, that the computer systems are suitably equipped to handle the backup data and backup protocols with data storage, such as hard disks, and a computer readable medium for storing computer program code.

Steps of the method of claim 52 include "exchanging messages among computers of the plurality to determine the ability of each to satisfy backup storage requirements of one or more others." The Applicants' specification explains at page 18, line 21, to page 19, line 15, that to establish the reciprocal agreement, the computer system exchanges information with a potential backup partner to determine whether the potential backup partner is able to meet certain requirements such as a predictable and suitable time schedule for being available and having sufficient network communication bandwidth for transferring data.

Claim 52 also recites "forming a partnership among computers of the plurality in which a first computer in the partnership stores backup data received from one or more other computers in the partnership and one or more of the other computers in the partnership store backup data received from the first computer." As explained in the Applicants' specification at page 9, lines 9-15, a first computer system assumes the task of holding backup data received via the network from a second computer system; in return, a second computer system assumes the task of holding backup data from the first computer system. And, as explained at page 9, lines 15-16, the first and second backup partners mutually impose on each other the duty to maintain the backup data

by adhering to a cooperative backup protocol. As further explained at page 9, lines 21-22, the first computer system may back up more than one computer system and, in return, more than one computer system helps back up the first computer system.

Claim 52 also recites "periodically verifying that stored backup data is being retained by one or more of the computers in the partnership." As explained in the Applicants' specification at page 11, lines 19-21, participation in the cooperative backup system involves establishing backup partnerships among computer systems and honoring the reciprocal backup agreements. And, as explained at page 11, lines 21-26, to verify that the agreements with its backup partners are honored, the computer system verifies periodically that its backup partners have retained previously backup data. A manner of performing this verification is described in detail in the Applicants' specification at page 12, line 14, to page 15, line 5.

Claim 53

Claim 53 is dependent from claim 1 and recites "wherein said forming comprises forming at least two partnerships among the plurality of computers." At page 7, lines 26-28, the Applicants' specification explains that pairs of the computers are expected to cooperate with each other in a backup partnership for backing up each other's data.

Claim 54

Claim 54 is dependent from claim 1 and recites "wherein at least one computer of the plurality assumes the task of storing backup data received from at least two other computers." The Applicants' specification explains at page 9, lines 21-22, that a

first computer system may back up more than one computer system and, in turn, more than one computer system may back up the first computer system.

Claim 55

Claim 55 is dependent from claim 1 and recites "wherein different portions of data of at least one computer of the plurality are stored by at least two other computers." The Applicants' specification explains at page 11, lines 3-7, that data to be backed up is distributed to backup partners. And, at page 9, lines 21-22, the Applicants' specification explains that more than one computer system may back up a particular computer system.

Claim 56

Claim 56 is dependent from claim 49 and recites "further comprising at least one additional partnership among the plurality of computers." At page 7, lines 26-28, the Applicants' specification explains that pairs of the computers are expected to cooperate with each other in a backup partnership for backing up each other's data.

Claim 57

Claim 57 is dependent from claim 49 and recites "wherein the first computer of the partnership stores backup data received from at least two other computers in the partnership." The Applicants' specification explains at page 9, lines 21-22, that a first computer system may back up more than one other computer system.

Claim 58

Claim 58 is dependent from claim 49 and recites "wherein different portions of data of the first computer of the plurality are stored by at least two other computers in the partnership." The Applicants' specification explains at page 9, lines 21-22, that more than one computer system may back up a particular computer system. And, at page 11, lines 3-7, the Applicants' specification explains that data to be backed up is distributed to backup partners.

(vi) Grounds of Rejection to be Reviewed on Appeal

Whether claims 1-4, 15-28, 30 and 44-58 are unpatentable under 35 U.S.C. § 103 as allegedly being obvious in view of U.S. Patent No. 4,631,644 to Bachman (hereinafter "Bachman") and U.S. Patent No. 5,771,354 to Crawford (hereinafter "Crawford").

(vii) Argument

a. Rejections under 35 U.S.C. § 103 in view of Bachman and Crawford

Claim 1

Claims 1-4, 15-28, 30 and 44-58 are rejected under 35 U.S.C. § 103 as allegedly being obvious in view of U.S. Patent No. 4,631,664 to Bachman (hereinafter "Bachman"), in view of U.S. Patent No. 5,771,354 to Crawford (hereinafter "Crawford"). Regarding claim 1, the office action alleges that Bachman discloses all of its elements at col. 3, line 21 to col. 4, line 58 and col. 5, line 13 to col. 8, line 40, except that Bachman "fails to mention a partnership in backing up data." The office action further alleges that:

Crawford teaches an Internet online backup system interactively establishes backup services which allows one (or more) partnership ("Diagnostics and Maintenance Services (block 204) include various programs stored on virtual disks to checkout, troubleshoot, and enhance the customer computer 50. Diagnostic programs can detect problems with memory or system board components. Peripheral management programs can be used for testing, alignment, storage maintenance, etc., to improve device throughput. Hardware errors detected by diagnostic programs during a customer automated session can trigger repair service based on a maintenance agreement. ") among plurality of computers (100, 120). In one preferred embodiment, replica computer 160 is capable of operating in an on-line mode or in an off-line mode. In the on-line mode, the replica computer 160 communicates interactively with customer computer 50 to perform processing tasks. In this on-line mode in the preferred embodiment, the customer computer 50 and the on-line replica computer 160 cooperate to support processing in either and/or both processors (shared access to data buffers and a record locking scheme is used to ensure safe access). In the off-line mode, replica computer 160 performs personal computer tasks in response to direction from host computer 104 without having an on-line, interactive link with customer computer 50.

The business practice of backing up data is notoriously well known in information management. To back up data for the purpose of a secure record management and to improve load balancing, reduction or elimination of fragmentation, and to prevent loss of data from an occurrence of a multiple storage failure.

It would have been obvious to make use of the partnership database management of Bachman to allow data management to store, retrieve, and modifies data records in computers over the network to include data backup as one of its services offered to customer(s)/client(s)/partner(s) in view of the express suggestion in Crawford.

See, office action mailed on Sept. 26, 2006, at pages 2-4. The identical statements are repeated in the final office action mailed on April 19, 2007, at pages 2-4. The Applicants respectfully traverse the rejection. "Under §103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented." *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17-18 (1966). See also, *KSR Intl. Co. v. Teleflex Inc.*, 550 U.S. ____ (2007). Moreover, in order to properly reject a patent claim under 35 U.S.C. § 103, the claimed subject matter must be considered as a whole. See 35 U.S.C. § 103. When these principles are followed, it is apparent that the Applicants' claimed invention is not obvious in view of the cited references.

Bachman is directed toward database management systems. Bachman at col. 1, lines 7-8, and at col. 3, lines 10-11. Bachman discusses that a database is a physical and logical arrangement of data records and that database management systems allow storage, accessing and modification of data records within a database. Bachman at col. 1, line 51, to col. 2, line 14. Bachman discusses that prior database

management systems suffered from drawbacks in their inability to adequately represent a full range of relationships among objects. Bachman at col. 2, line 14, to col. 3, line 9. Bachman attempts to overcome this alleged drawback by incorporating two principles into a database management system: first, the concept of joining pairs of data records in “partnerships”; and, second, the concept of attaching of number of related partnerships to a “record.” Bachman at col. 3, lines 41-45. The “partnerships” of Bachman are defined as a “structure which establishes a logical relation between two records” in which “access to either one of the two records assures access to other record.” Bachman at col. 4, lines 13-18. The partnership data model structures described by Bachman may be combined in various ways to build data structures. Bachman at col. 4, lines 30-32.

Therefore, the Applicants agree that Bachman does not teach a partnership in backing up data, as in Applicants’ claim 1. Further, the “partnerships” discussed by Bachman are entirely unrelated to the partnerships recited in Applicants’ claim 1 because they relate solely to a logical relation between two data records in which access to one record assures access to another record. This “partnership” is entirely distinct from the partnerships of Applicants’ claim 1 at least because the partnerships of claim 1 are among computer systems. In fact, Bachman does not teach or suggest any form of partnerships among computer systems. Moreover, Bachman does not teach anything related to backing up data. In contrast, the Applicants’ claim 1 is directed toward partnerships among computer systems for backing up data. In view of these differences, it is clear that Bachman is in an entirely different field of endeavor from Applicants’ claim 1 and does not teach any of the elements of Applicants’ claim 1.

Further, claim 1 recites that “a first computer in each partnership assumes the task of storing backup data received from one or more other computers in the partnership and one or more of the other computers in the partnership assume the task of storing backup data received from the first computer...”. Therefore, claim 1 requires a reciprocal partnership in which each computer in a partnership stores data of the others. Bachman clearly does not disclose such a feature since Bachman teaches nothing about partnerships among computers and teaches nothing about backing up data.

Crawford also does not teach or suggest the features of Applicants’ claim 1 that are missing from Bachman. Particularly, Crawford is directed toward on-line services that provide automated information processing to computer users for a fee. Crawford at col. 1, lines 9-12. Among the services provided is an archival service in which customer files are copied to on-line service virtual disks for offsite archiving. Crawford at col. 14, lines 45-48. Thus, it is clear from Crawford that this archiving service is provided to the customer by on-line service in exchange for payment. In other words, the provision of services in Crawford is one-way. Therefore, Applicants’ claim 1 is distinguishable from this aspect of Crawford since Applicants’ claim 1 requires a reciprocal partnership in which each computer in a partnership stores data of the other computers in the partnership.

The office action alleges that the “replica computer 160” of Crawford discloses features of Applicants’ claims. According to Crawford, the replica computer 160 is included in the on-line service’s information server 100 and is the same type of computer as is a customer’s computer 50. Crawford at col. 17, lines 1-6, and at Figure 4. The replica computer 160 adds processing capabilities to the information server 100 and may be used to perform the same types of processing that

the customer's computer 50 is capable of performing. Crawford at col. 17, lines 7-12. The Applicants' claim 1 is distinguishable from this aspect of Crawford because there is no teaching or suggestion in Crawford that the "replica computer 160" might perform any functions of a reciprocal partnership for backing up data.

In marked contrast to the one-way type of services disclosed by Crawford, Applicants' claim 1 requires that each computer in a partnership commits under an agreement to store backup data received from one or more of its backup partners. In other words, claim 1 requires the exchange of services for services among the computers of the partnerships (i.e. the agreements are two-way among the backup partners). Neither Crawford, nor Bachman, taken singly or in combination, teaches or suggests this feature of Applicants' claim 1. For at least this reason, claim 1 is allowable over Bachman and Crawford.

The Applicants previously submitted the substance of the above arguments in response to the office action mailed on September 26, 2007. See, Applicants' response mailed on January 24, 2007. The final office action mailed on April 19, 2007, contains the following comments that are alleged to be responsive to the Applicants' arguments.

First, the office action mailed on April 19, 2007, states:

In response to the applicant's argument that Bachman and Crawford fail to teach: each computer in a partnership commits under and agreement to store backup data received from one or more of its backup partners, and the a first computer in each partnership assumes the task of storing backup data received from one or more other computers in the partnership and one or more of the other computers in the partnership assume the task of storing backup

data received from the first computer, the PTO respectfully submits that this is taught by Bachman in col. 3, line 21-col. 4 line 58 as cited above as well as various cited areas in Crawford.

See, office action mailed April 17, 2007, at pages 4-5. The Applicants respectfully disagree with this statement. The referenced portion of Bachman is the entire Summary of Bachman. However, the substance of this allegation regarding Bachman has been fully addressed in the arguments above. Particularly, the partnerships discussed in Bachman are entirely unrelated to the partnerships recited in Applicants' claim 1 because they relate solely to a logical relation between two data records in which access to one record assures access to another record. This "partnership" is entirely distinct from the partnerships of Applicants' claim 1 at least because the partnerships of claim 1 are among computer systems. In fact, Bachman does not teach or suggest any form of partnerships among computer systems. Moreover, Bachman does not teach anything related to backing up data. The substance of the allegations regarding Crawford have also been fully addressed in the arguments above. Particularly, Crawford is directed toward one-way provision of services; as such, Crawford does not disclose reciprocal agreements for backing up data as in Applicants' claim 1.

Therefore, the Applicants respectfully submit that rather than being responsive to Applicants' arguments, the comments above merely repeat the incorrect assertions from the prior office action.

Second, the office action mailed on April 17, 2007, states:

In response to the Applicants' argument that neither Bachman nor Crawford teach exchanging messages among computers of the plurality to determine the ability of each to satisfy backup storage requirements of one or more others, the PTO respectfully disagrees and submits that this is taught by Crawford. Figure 9:480, for example, illustrates a server sending available drive information to customer drives. The information is interpreted as the exchanging message as claimed.

See, office action mailed April 17, 2007, at page 5. The Applicants respectfully disagree with this reasoning. It is clear from Crawford that block 480 of Figure 9 refers to one-way communication from a server to a client. This is unrelated to Applicants' claim 1 at least because claim 1 requires the formation of reciprocal, two-way partnerships.

Finally, the office action mailed on April 17, 2007, states

In response to Applicants' argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art.

See, office action mailed April 17, 2007, at page 5 (citations omitted). The Applicants respectfully submit that this "argument" is really just a boilerplate statement of a general principle. It does not in any way answer the substance of the

Applicants' argument that it would not have been obvious to combine the references in the manner suggested in the office action.

In view of the above, the Applicants respectfully request reversal of the rejection of Applicants' claim 1. The Applicants also respectfully request reversal of the rejections of Applicants' claims 2-4, 15-28, 30, 44, 53, 54, and 55, since they are dependent from claim 1.

The Applicants call attention to the fact the final rejection mailed on April 17, 2007, is the sixth substantive office action issued in this case. In response to each of the prior office actions, the Applicants pointed out how the claims are patentably distinguishable over the cited references. As explained in detail above, the Applicants' claims are patentable over the Crawford and Bachman references now being relied upon. In view of numerous actions having been issued and rejections overcome, the Applicants respectfully submit that the claims have been thoroughly examined and are now due for allowance. Considering that the present application has now been pending for over seven years, reversal of the rejections at an early date would be greatly appreciated.

Claim 2

While dependent claim 2 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 2 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 2. Moreover, the Applicants respectfully submit that when claim 2

is considered as a whole, in conjunction with claim 1 from which it depends, claim 2 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 2 should be reversed.

Claim 3

While dependent claim 3 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 3 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 3. Moreover, the Applicants respectfully submit that when claim 3 is considered as a whole, in conjunction with claim 1 from which it depends, claim 3 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 3 should be reversed.

Claim 4

While dependent claim 4 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 4 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 4. Moreover, the Applicants respectfully submit that when claim 4

is considered as a whole, in conjunction with claim 1 from which it depends, claim 4 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 4 should be reversed.

Claim 15

While dependent claim 15 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 15 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 15. Moreover, the Applicants respectfully submit that when claim 15 is considered as a whole, in conjunction with claim 1 from which it depends, claim 15 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 15 should be reversed.

Claim 16

While dependent claim 16 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 16 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 16. Moreover, the Applicants respectfully submit that when claim

16 is considered as a whole, in conjunction with claim 1 from which it depends, claim 16 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 16 should be reversed.

Claim 17

While dependent claim 17 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 17 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 17. Moreover, the Applicants respectfully submit that when claim 17 is considered as a whole, in conjunction with claims 1 and 16 from which it depends, claim 17 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 17 should be reversed.

Claim 18

While dependent claim 18 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 18 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 18. Moreover, the Applicants respectfully submit that when claim

18 is considered as a whole, in conjunction with claims 1 and 16 from which it depends, claim 18 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 18 should be reversed.

Claim 19

While dependent claim 19 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 19 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 19. Moreover, the Applicants respectfully submit that when claim 19 is considered as a whole, in conjunction with claims 1, 16 and 18 from which it depends, claim 19 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 19 should be reversed.

Claim 20

While dependent claim 20 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 20 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 20. Moreover, the Applicants respectfully submit that when claim

20 is considered as a whole, in conjunction with claim 1 from which it depends, claim 20 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 18 should be reversed.

Claim 21

While dependent claim 21 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 21 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 21. Moreover, the Applicants respectfully submit that when claim 21 is considered as a whole, in conjunction with claims 1 and 20 from which it depends, claim 21 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 21 should be reversed.

Claim 22

While dependent claim 22 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 22 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 22. Moreover, the Applicants respectfully submit that when claim

22 is considered as a whole, in conjunction with claims 1 and 20 from which it depends, claim 22 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 22 should be reversed.

Claim 23

While dependent claim 23 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 23 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 23. Moreover, the Applicants respectfully submit that when claim 23 is considered as a whole, in conjunction with claims 1 and 2 from which it depends, claim 23 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 23 should be reversed.

Claim 24

While dependent claim 24 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 24 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 24. Moreover, the Applicants respectfully submit that when claim

24 is considered as a whole, in conjunction with claims 1 and 3 from which it depends, claim 24 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 24 should be reversed.

Claim 25

While dependent claim 25 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 25 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 25. Moreover, the Applicants respectfully submit that when claim 25 is considered as a whole, in conjunction with claims 1, 3 and 24 from which it depends, claim 25 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 25 should be reversed.

Claim 26

While dependent claim 26 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 26 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 26. Moreover, the Applicants respectfully submit that when claim

26 is considered as a whole, in conjunction with claims 1, 3 and 24 from which it depends, claim 26 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 26 should be reversed.

Claim 27

While dependent claim 27 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 27 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 27. Moreover, the Applicants respectfully submit that when claim 27 is considered as a whole, in conjunction with claims 1, 3 and 24 from which it depends, claim 27 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 27 should be reversed.

Claim 28

While dependent claim 28 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 28 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 28. Moreover, the Applicants respectfully submit that when claim

28 is considered as a whole, in conjunction with claims 1, 3 and 24 from which it depends, claim 28 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 28 should be reversed.

Claim 30

While dependent claim 30 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 30 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 30. Moreover, the Applicants respectfully submit that when claim 30 is considered as a whole, in conjunction with claim 1 from which it depends, claim 30 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 30 should be reversed.

Claim 44

Claim 44 stands or falls with claim 1 from which it depends.

Claim 45

Similarly to claim 1, independent claim 45 requires that a first computer in each partnership assumes the task of storing backup data received from one or more other computers in the partnership and one or more of the other computers in the partnership assume the task of storing backup data received from the first computer.

As explained above, Bachman and Crawford, taken singly or in combination, do not suggest or disclose such a feature. Accordingly, claim 45 is allowable over Bachman and Crawford.

In view of the above, the Applicants respectfully request reversal of the rejection of Applicants' claim 45. The Applicants also respectfully request reversal of the rejections of Applicants' claims 46 and 47, since they are dependent from claim 1.

Claim 46

While dependent claim 46 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 46 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 46. Moreover, the Applicants respectfully submit that when claim 46 is considered as a whole, in conjunction with claim 45 from which it depends, claim 46 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 45 should be reversed.

Claim 47

While dependent claim 47 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 47 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of

Applicants' claim 47. Moreover, the Applicants respectfully submit that when claim 47 is considered as a whole, in conjunction with claim 45 from which it depends, claim 47 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 47 should be reversed.

Claim 48

Similarly to claim 1, independent claim 48 requires that a first computer in each partnership assumes the task of storing backup data received from one or more other computers in the partnership and one or more of the other computers in the partnership assume the task of storing backup data received from the first computer. As explained above, Bachman and Crawford, take singly or in combination, do not suggest or disclose such a feature. Accordingly, claim 48 is allowable over Bachman and Crawford.

In view of the above, the Applicants respectfully request reversal of the rejection of Applicants' claim 48.

Claim 49

Similarly to claim 1, independent claim 49 requires that a first computer in each partnership assumes the task of storing backup data received from one or more other computers in the partnership and one or more of the other computers in the partnership assume the task of storing backup data received from the first computer. As explained above, Bachman and Crawford, take singly or in combination, do not suggest or disclose such a feature. Accordingly, claim 49 is allowable over Bachman and Crawford.

Further, claim 49 recites exchanging messages among computers of the plurality to determine the ability of each to satisfy backup storage requirements of one or more others. Regarding this claim limitation, the office action mailed on April 17, 2007, states:

In response to the Applicants' argument that neither Bachman nor Crawford teach exchanging messages among computers of the plurality to determine the ability of each to satisfy backup storage requirements of one or more others, the PTO respectfully disagrees and submits that this is taught by Crawford. Figure 9:480, for example, illustrates a server sending available drive information to customer drives. The information is interpreted as the exchanging message as claimed.

See, office action mailed April 17, 2007, at page 5. The Applicants respectfully disagree with this reasoning. It is clear from Crawford that block 480 of Figure 9 refers to one-way communication from a server to a client. However, claim 49 requires "exchanging messages among computers of the plurality to determine the ability of each to satisfy backup storage requirements of one or more others." Therefore, claim 49 requires that the exchange of messages determines the reciprocal (i.e. two-way) abilities of the potential backup partners. The Applicants submit that neither Bachman, nor Crawford disclose such a feature. This is another reason why claim 49 is allowable.

In view of the above, the Applicants respectfully request reversal of the rejection of Applicants' claim 49. The Applicants also respectfully request reversal of

the rejections of Applicants' claims 50 and 51, since they are dependent from claim 49.

Claim 50

While dependent claim 50 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 50 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 50. Moreover, the Applicants respectfully submit that when claim 50 is considered as a whole, in conjunction with claim 49 from which it depends, claim 50 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 50 should be reversed.

Claim 51

Claim 51 stands or falls with claim 49 from which it depends.

Claim 52

Similarly to claim 1, independent claim 52 requires that a first computer in each partnership assumes the task of storing backup data received from one or more other computers in the partnership and one or more of the other computers in the partnership assume the task of storing backup data received from the first computer. As explained above, Bachman and Crawford, taken singly or in combination, do not

suggest or disclose such a feature. Accordingly, claim 52 is allowable over Bachman and Crawford.

Further, claim 52 recites exchanging messages among computers of the plurality to determine the ability of each to satisfy backup storage requirements of one or more others. The Applicants submit that neither Bachman, nor Crawford disclose such a feature. This is another reason why claim 52 is allowable.

In view of the above, the Applicants respectfully request reversal of the rejection of Applicants' claim 52.

Claim 53

While dependent claim 53 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 53 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 53. Moreover, the Applicants respectfully submit that when claim 53 is considered as a whole, in conjunction with claim 1 from which it depends, claim 53 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 53 should be reversed.

Claim 54

While dependent claim 54 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 54 are alleged to be obvious in view of Bachman and Crawford.

See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 54. Moreover, the Applicants respectfully submit that when claim 54 is considered as a whole, in conjunction with claim 1 from which it depends, claim 54 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 54 should be reversed.

Claim 55

While dependent claim 55 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 55 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 55. Moreover, the Applicants respectfully submit that when claim 55 is considered as a whole, in conjunction with claim 1 from which it depends, claim 55 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 55 should be reversed.

Claim 56

While dependent claim 56 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 56 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the

final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 56. Moreover, the Applicants respectfully submit that when claim 56 is considered as a whole, in conjunction with claim 49 from which it depends, claim 56 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 56 should be reversed.

Claim 57

While dependent claim 57 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 57 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of Applicants' claim 57. Moreover, the Applicants respectfully submit that when claim 57 is considered as a whole, in conjunction with claim 49 from which it depends, claim 57 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 57 should be reversed.

Claim 58

While dependent claim 58 is rejected in view of Bachman and Crawford, there has been no attempt to identify with any particularity why the specific limitations of Applicants' claim 58 are alleged to be obvious in view of Bachman and Crawford. See, office actions mailed on September 26, 2006 and April 17, 2007. Therefore, the final rejection fails to provide a *prima facie* case that would support the rejection of

Applicants' claim 58. Moreover, the Applicants respectfully submit that when claim 58 is considered as a whole, in conjunction with claim 49 from which it depends, claim 58 is not obvious in view of Bachman and Crawford.

For at least these reasons, the Applicants respectfully submit that the rejection of claim 58 should be reversed.

c. Conclusion

In view of the above, the Applicants submit that all of the pending claims are allowable over the cited art. Accordingly, the Applicants request that the rejections be reversed.

Respectfully Submitted,

Dated: _____

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(viii) Claims Appendix

1 1. A method for backing up data on a plurality of computers connected via a
2 network, comprising:

3 forming one or more backup partnerships among the plurality of
4 computers such that each computer in a backup partnership commits under an
5 agreement to store backup data received from one or more backup partners,
6 whereby a first computer in each partnership assumes the task of storing backup
7 data received from one or more other computers in the partnership and one or
8 more of the other computers in the partnership assume the task of storing backup
9 data received from the first computer;

10 backing up data in accordance with each agreement; and

11 periodically verifying that previously backed up data is being retained by
12 the computers committed to act as backup partners in accordance with each
13 agreement.

1 2. The method of claim 1, further comprising:

2 selecting potential backup partners from among the plurality computers
3 based on predetermined criteria.

1 3. The method of claim 1, further comprising:

2 negotiating the agreements between the plurality of computers based on
3 predetermined requirements, including backup requirements.

1 4. The method of claim 1, wherein the plurality of computers administer a
2 distributed cooperative backing up of data in the absence of central control.

1 5. The method of claim 1, wherein each time before the data is backed up the
2 data is encoded with an erasure code.

1 6. The method of claim 1, wherein each time before the data is backed up the
2 data is encoded with an error correction code.

1 7. The method of claim 1, wherein each time before the data is backed up the
2 data is encrypted.

1 8. The method of claim 1, wherein each time before the data is backed up the
2 data is encoded with an erasure code and then encrypted, the encoding being for
3 fault tolerance and the encryption being for data security.

1 9. The method of claim 1, wherein each time before the data is backed up the
2 data is compressed and then encoded with an erasure code.

1 10. The method of claim 9, wherein the compression is a lossless data
2 compression.

1 11. The method of claim 1, wherein each time before the data is backed up the
2 data is, in sequence, compressed, encoded with an erasure code and encrypted.

1 12. The method of claim 1, wherein each time before the data is backed up the
2 method further comprises, in sequence:

3 performing data compression;

4 performing a first data encryption;

5 performing encoding with an erasure code; and

6 performing a second data encryption.

1 13. The method of claim 12, wherein the first encryption is for data security
2 and the second encryption is for preventing freeloading by any of the backup
3 partners, and wherein the encoding is for fault tolerance.

1 14. The method of claim 1, further comprising:
2 restoring data from the previously backed up data.

1 15. The method of claim 1, wherein each of the plurality of computers has a
2 storage, the storage being periodically scanned to find data to be backed up and
3 identify data previously backed up that no longer needs to be backed up, the data
4 to be backed up being retrieved from the storage for a next periodic backup.

1 16. The method of claim 1, wherein the verifying that previously backed up
2 data is retained by the backup partners includes monitoring the backup partners,
3 and for any one of the backup partners being monitored,
4 selecting a block of data stored at the monitored backup partner,
5 requesting the block of data from the monitored backup partner, and
6 receiving from the monitored backup partner and checking the block of
7 data to determine if the block of data represents a corresponding block of
8 previously backed up data.

1 17. The method of claim 16, wherein the block is selected randomly.

1 18. The method of claim 16, wherein the block is selected using a protocol to
2 produce a number that corresponds to the selected block and that is controlled by
3 at least two backup partners.

1 19. The method of claim 18, wherein the protocol, being performed by any
2 computer of the plurality of computers, includes
3 sending by the computer to a monitored one of its backup partners a hash
4 value of a first random number,
5 receiving by the computer from the monitored one of its backup partners a
6 second random number,
7 sending by the computer to the monitored one of its backup partners the
8 first random number,

9 computing the number from the first and second random numbers by both
10 the computer and the monitored one of its backup partners.

1 20. The method of claim 1, further comprising:

2 selecting another computer connected via the network to be a new backup
3 partner if it is determined that a backup partner has reneged by not retaining the
4 previously backed up data;

5 negotiating and, if an agreement is reached, forming a partnership with the
6 other computer, accepting the other computer as the new backup partner.

1 21. The method of claim 20, wherein selecting another computer to be the
2 new backup partner includes

3 determining if there are sufficient backup partners for backing up the data,
4 and

5 searching for the other computer based on predetermined criteria including
6 one or both of geographic separation and system diversity.

1 22. The method of claim 20, wherein if after accepting the other computer as
2 the new backup partner it is determined that the backup partners are insufficient in
3 number for backing up the data, the selecting, negotiating and forming backup
4 partnership with yet another computer are repeated, the determining, selecting,
5 negotiating and forming backup partnership being repeated until the number of
6 backup partners is sufficient.

1 23. The method of claim 2, wherein selecting computers as potential backup
2 partners includes
3 determining if there are sufficient backup partners for backing up the data,
4 and
5 searching for computers based on the predetermined criteria that includes
6 one or both of geographic separation and system diversity.

1 24. The method of claim 3, wherein negotiating the agreements includes, for
2 any computer of the plurality of computers,
3 exchanging queries between the computer and computers selected as its
4 potential backup partners about each such computer's ability to satisfy the
5 predetermined requirements that include one or more of
6 predictable and suitable time schedule for being on-line,
7 suitable network bandwidth,
8 matching backup space requirements, and
9 backup track record.

1 25. The method of claim 24, wherein, the computer prefers to partner with
2 those of its potential backup partners that satisfy the predetermined requirements.

1 26. The method of claim 24, wherein the suitable network bandwidth is equal
2 or larger than a predetermined threshold bandwidth and is characterized by an
3 average bandwidth that is larger than the predetermined threshold bandwidth.

1 27. The method of claim 24, wherein the backup track record includes not
2 reneging on a number of other backup partners that is greater than a
3 predetermined number.

1 28. The method of claim 1, wherein each of the backup partners has a recent
2 copy of a list of its backup partners' other backup partners.

1 29. The method of claim 1, wherein a user of each of the plurality of
2 computers can obtain a copy of a list containing identifiers and/or identities of the
3 backup partners associated therewith and an encryption key under which the data
4 is encrypted prior to being backed up.

1 30. The method of claim 1, wherein the agreements are respectively
2 negotiated between the plurality of computers such that in each partnership each
3 computer commits to avoid making or honoring a data restoration request for a
4 commitment period that is longer than a grace period, wherein the grace period
5 for a backup partner of a computer starts to run if it is determined that the backup
6 partner has failed to respond to such computer verifying that the backup partner is
7 retaining the previously backed up data or to prove to such computer that it is

8 retaining the previously backed up data, and wherein upon the grace period
9 running out such computer considers the backup partner to have reneged on its
10 agreement.

1 31. The method of claim 7, wherein any encryption algorithm can be suitably
2 used for encrypting the data being backed up, including DES (data encryption
3 standard), RC4, RSA or other public-key encryption.

1 32. The method of claim 6, wherein the error correction code is a Reed
2 Solomon code.

1 33. The method of claim 5, wherein for a low degree of fault tolerance the
2 erasure code is $n+1$ -parity.

1 34. The method of claim 7, wherein after the encryption of the data the
2 encrypted data is divided into blocks and cryptographic checksums or digital
3 signature are added to each block before the blocks are sent each to a particular
4 one of the backup partners.

1 35. The method of claim 5, wherein the encoding with the erasure code uses
2 Tornado coding.

1 36. The method of claim 5, wherein the encoding with the erasure code
2 includes
3 dividing the data being backed up into blocks, and
4 adding redundancy to each of the blocks producing data objects with
5 actual data portions and redundant data portions, so that each one of the actual
6 data portions and redundant data portions is being backed up at a distinct one of
7 the backup partners.

1 37. The method of claim 1, further comprising:
2 dividing the data being backed up into blocks;
3 creating a hash value of each of the blocks using a key; and
4 correspondingly appending the hash values to their blocks before the
5 blocks are each sent to a distinct one of the backup partners.

1 38. The method of claim 37, wherein the hash values are later used in
2 periodically verifying that the previously backed up data is retained by the backup
3 partners and, if needed, that the previously backed up data being retained is valid
4 and can be used to restore lost data.

1 39. The method of claim 37, wherein the periodic verifying includes
2 selecting and requesting a particular one of the data blocks that was
3 previously backed up,
4 retrieving the particular one of the data blocks and its associate hash value,

5 computing a new hash value from the retrieved particular block using the
6 key, and

7 comparing the new hash value with the associated hash value to determine
8 if they are equal, equality indicating that the data block is retained by the backup
9 partner and is valid.

1 40. The method of claim 1, wherein the encoding includes dividing the data
2 being backed up into p groups of m blocks, each of the p groups representing a
3 vector of actual data and the m blocks in each of the p groups representing m
4 elements of the actual data vector; and adding redundancy to each actual data
5 vectors producing p codewords each being a vector of $n=m+k$ elements, so that
6 each one of the n elements is being backed up at a distinct one of the backup
7 partners.

1 41. The method of claim 14, wherein the restoring of data from the previously
2 backed up data includes

3 retrieving blocks of the previously backed up data from the backup
4 partners until sufficient blocks of the previously backed up data are available for
5 decoding,

6 checking, for each retrieved block of the previously backed up data, if the
7 retrieved block is valid and intact,

8 decoding all the retrieved blocks of the previously backed up data to
9 reconstruct the data originally backed up.

1 42. The method of claim 14, wherein the restoring of data from the previously
2 backed up data includes

3 retrieving previously backed up data from the backup partners until
4 sufficient previously backed up data is available for decoding,
5 decoding all the retrieved previously backed up data to reconstruct the
6 data originally backed up, and
7 decrypting the data originally backed up to obtain the actual data.

1 43. The method of claim 14, wherein the restoring of data from the previously
2 backed up data includes

3 retrieving previously backed up data from the backup partners until
4 sufficient previously backed up data is available for decoding, and
5 decrypting, decoding and decompressing all of the retrieved previously
6 backed up data.

1 44. The method of claim 1, wherein the data being backed up is file contents.

1 45. A distributed cooperative backup system, comprising:

2 a network; and

3 a loose confederation of computers connected via the network, a plurality
4 of computers from among the loose confederation of computers being configured
5 for distributed cooperative backing up of data, each computer of the plurality of

6 computers having a storage that can be used for providing reciprocal backup
7 services, and each computer of the plurality of computers respectively having a
8 computer readable medium embodying computer program code configured to
9 cause the computer to

10 form backup partnerships between the plurality of computers, each of the
11 backup partnerships being of computers such that each computer in a partnership
12 commits under an agreement to store backup data received from one or more
13 backup partners, whereby a first computer in each partnership assumes the task of
14 storing backup data received from one or more other computers in the partnership
15 and one or more of the other computers in the partnership assume the task of
16 storing backup data received from the first computer;

17 back up data in accordance with each agreement; and

18 periodically verify that previously backed up data is being retained by the
19 computers committed to act as backup partners in accordance with each
20 agreement.

1 46. The system of claim 45, wherein each of the backup partners is allowed to
2 leave the system and return to the system.

1 47. The system of claim 45, wherein prevention of freeloading is enforced by
2 the backup partners, by any of the backup partners being requested to prove that it
3 is retaining the previously backed up data.

1 48. A distributed cooperative backup system, comprising:
2 a network; and
3 a loose confederation of computers connected via the network, a plurality
4 of computers from among the loose confederation of computers being configured
5 for distributed cooperative backing up of data and functioning as backup partners,
6 each computer of the plurality of computers having a storage that can be used for
7 providing reciprocal backup services, and each computer of the plurality of
8 computers respectively having a computer readable medium embodying computer
9 program code configured to cause the computer to
10 select computers as potential backup partners from among the plurality of
11 computers based on predetermined criteria,
12 negotiate a reciprocal backup partnership agreement between the computer
13 and the selected computers based on predetermined requirements, including
14 backup requirements,
15 form partnerships between the computer and selected computers, the
16 computer and the selected computers becoming backup partners by agreeing to
17 cooperatively provide backup services to each other such that a first computer in
18 each partnership assumes the task of storing backup data received from one or
19 more other computers in the partnership and one or more of the other computers
20 in the partnership assume the task of storing backup data received from the first
21 computer and so that a distributed cooperative backing up of data is administered
22 in the absence of central control,

23 periodically back up data at the backup partners, encoding the data each
24 time before the data is backed up, and
25 periodically verify that previously backed up data is retained by the
26 backup partners.

1 49. A method for backing up data on a plurality of computers connected via a
2 network, comprising:

3 exchanging messages among computers of the plurality to determine the
4 ability of each to satisfy backup storage requirements of one or more others;

5 forming a partnership among computers of the plurality in which a first
6 computer in the partnership stores backup data received from one or more other
7 computers in the partnership and one or more of the other computers in the
8 partnership store backup data received from the first computer; and

9 each of the computers in the partnership periodically verifying that its
10 backup data is being retained by one or more of the other computers in the
11 partnership.

1 50. The method according to claim 49, wherein the verifying includes
2 selecting a block of the previously backed up data wherein the selecting is
3 controlled by at least two of the computers.

1 51. The method according to claim 49, wherein the partnership consists of two
2 computers.

1 52. Computer readable media having stored thereon computer code for a
2 method of backing up data on a plurality of computers connected via a network,
3 the method comprising steps of:

4 exchanging messages among computers of the plurality to determine the
5 ability of each to satisfy backup storage requirements of one or more others;

6 forming a partnership among computers of the plurality in which a first
7 computer in the partnership stores backup data received from one or more other
8 computers in the partnership and one or more of the other computers in the
9 partnership store backup data received from the first computer; and

10 periodically verifying that stored backup data is being retained by one or
11 more of the computers in the partnership.

1 53. The method according to claim 1, wherein said forming comprises
2 forming at least two partnerships among the plurality of computers.

1 54. The method according to claim 1, wherein at least one computer of the
2 plurality assumes the task of storing backup data received from at least two other
3 computers.

1 55. The method according to claim 1, wherein different portions of data of at
2 least one computer of the plurality are stored by at least two other computers.

1 56. The method according to claim 49, further comprising at least one
2 additional partnership among the plurality of computers.

1 57. The method according to claim 49, wherein the first computer of the
2 partnership stores backup data received from at least two other computers in the
3 partnership.

1 58. The method according to claim 49, wherein different portions of data of
2 the first computer of the plurality are stored by at least two other computers in the
3 partnership.

(ix) Evidence Appendix

None.

(x) Related Proceedings Appendix

None